

Hydrologic Workshop

USGS Kentucky District

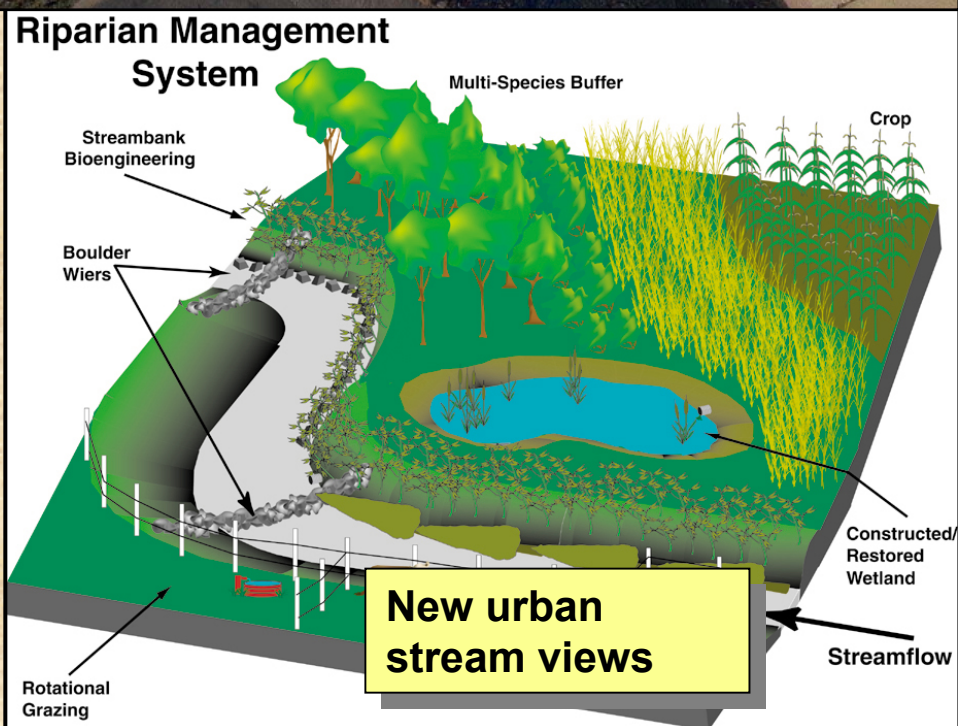
Rapid Stream Assessment

Urban Stream Restoration

Don Roseboom and Tim Straub,
USGS, Illinois District

Workshop Outline

1. *Rapid Assessment of Streams and Wetlands*
2. *Performance of Stream Bioengineering BMP after 4+ years*

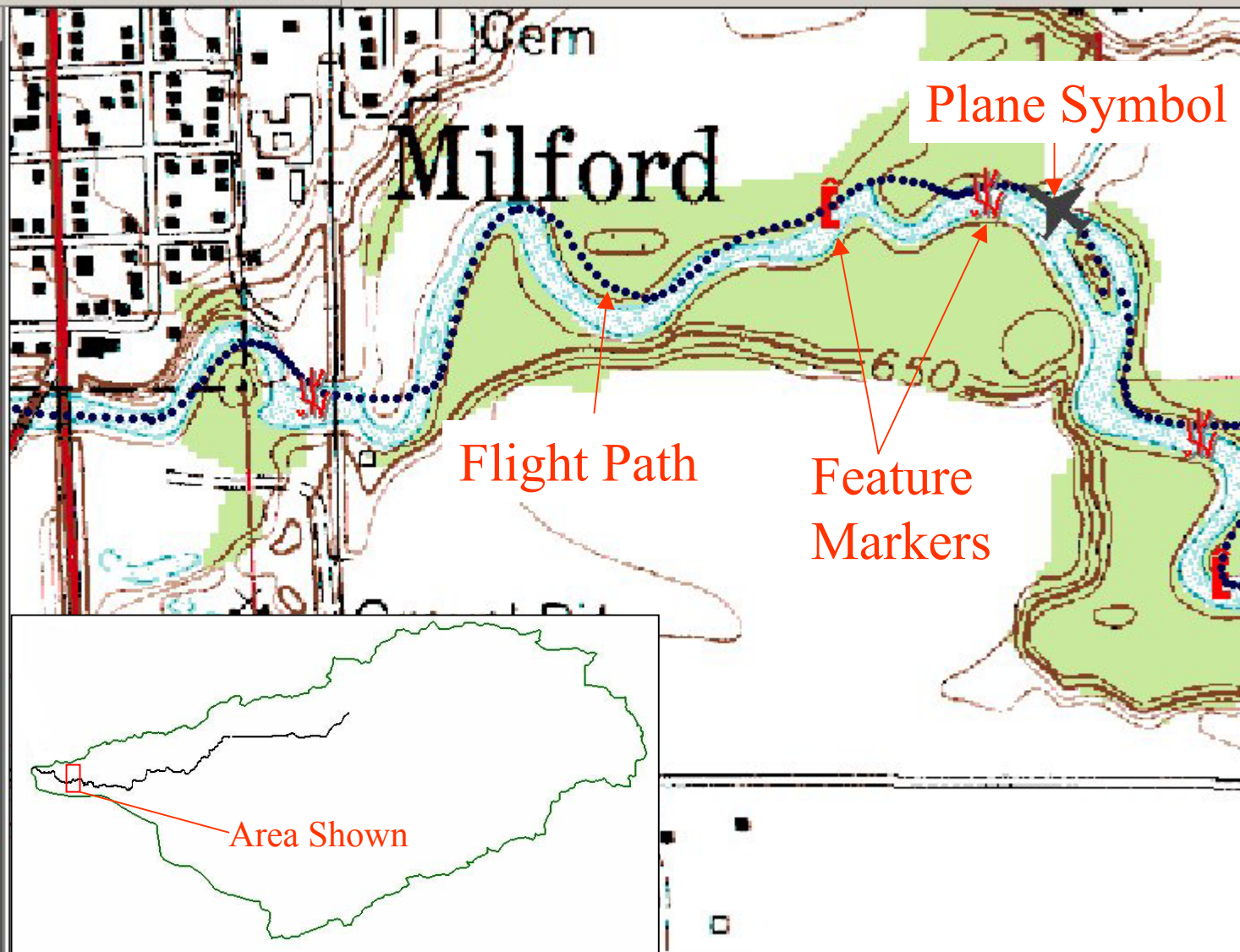
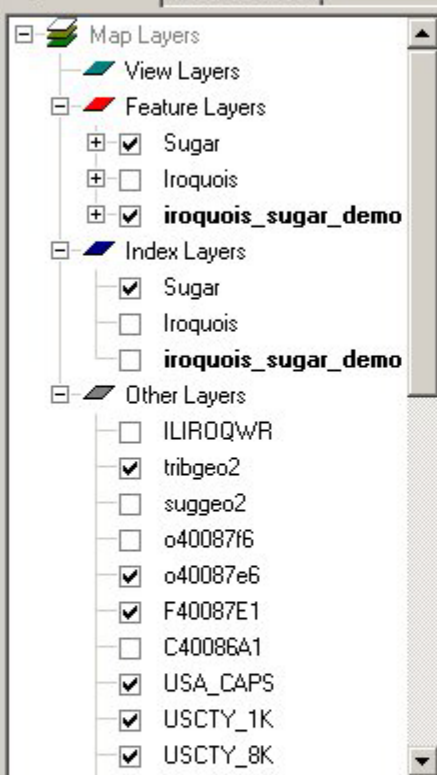








Layer Browser Media Browser

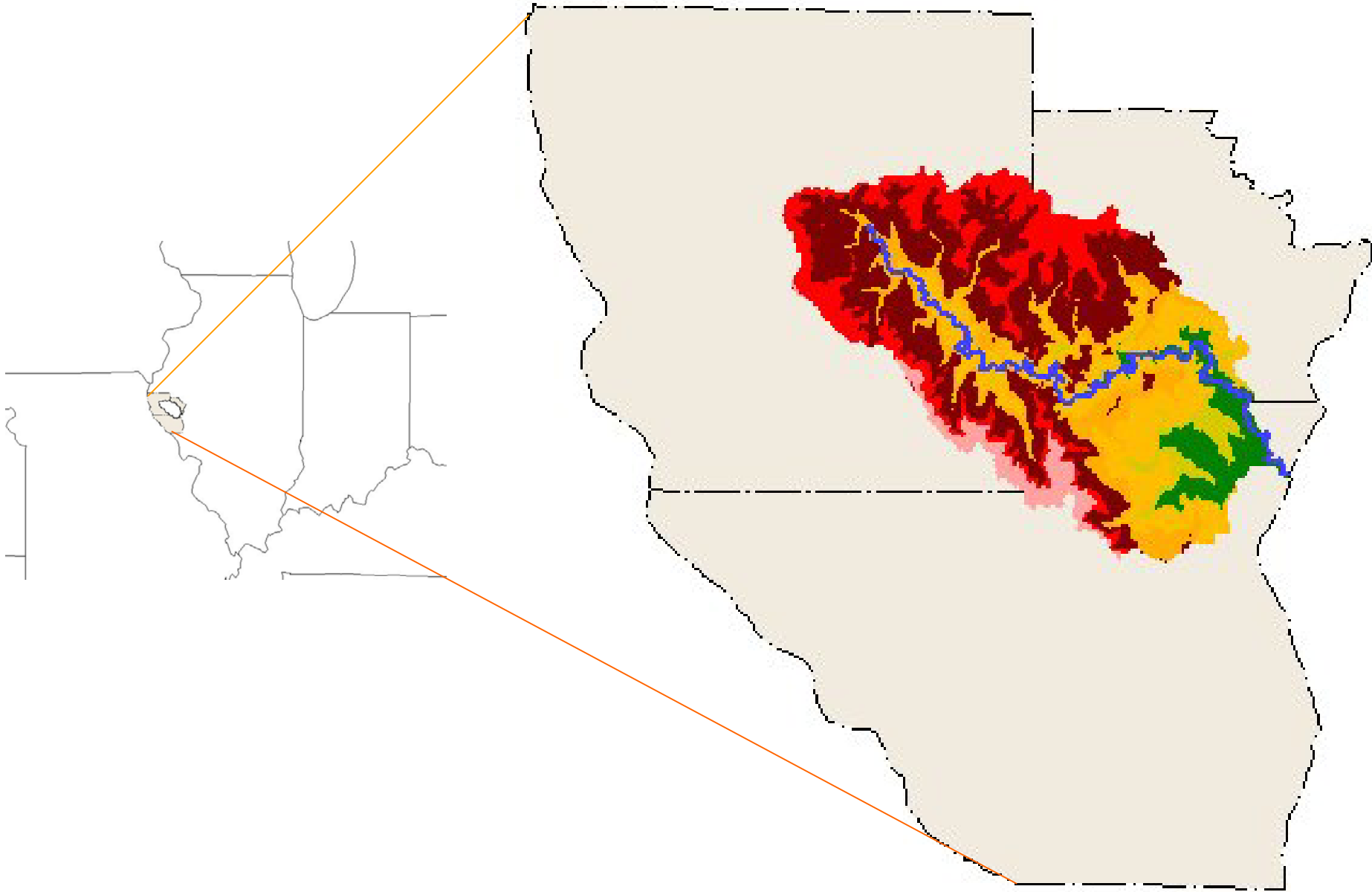


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Results – McKee Creek



Stream Restoration begins with
the streambed

Channel Evolution Model

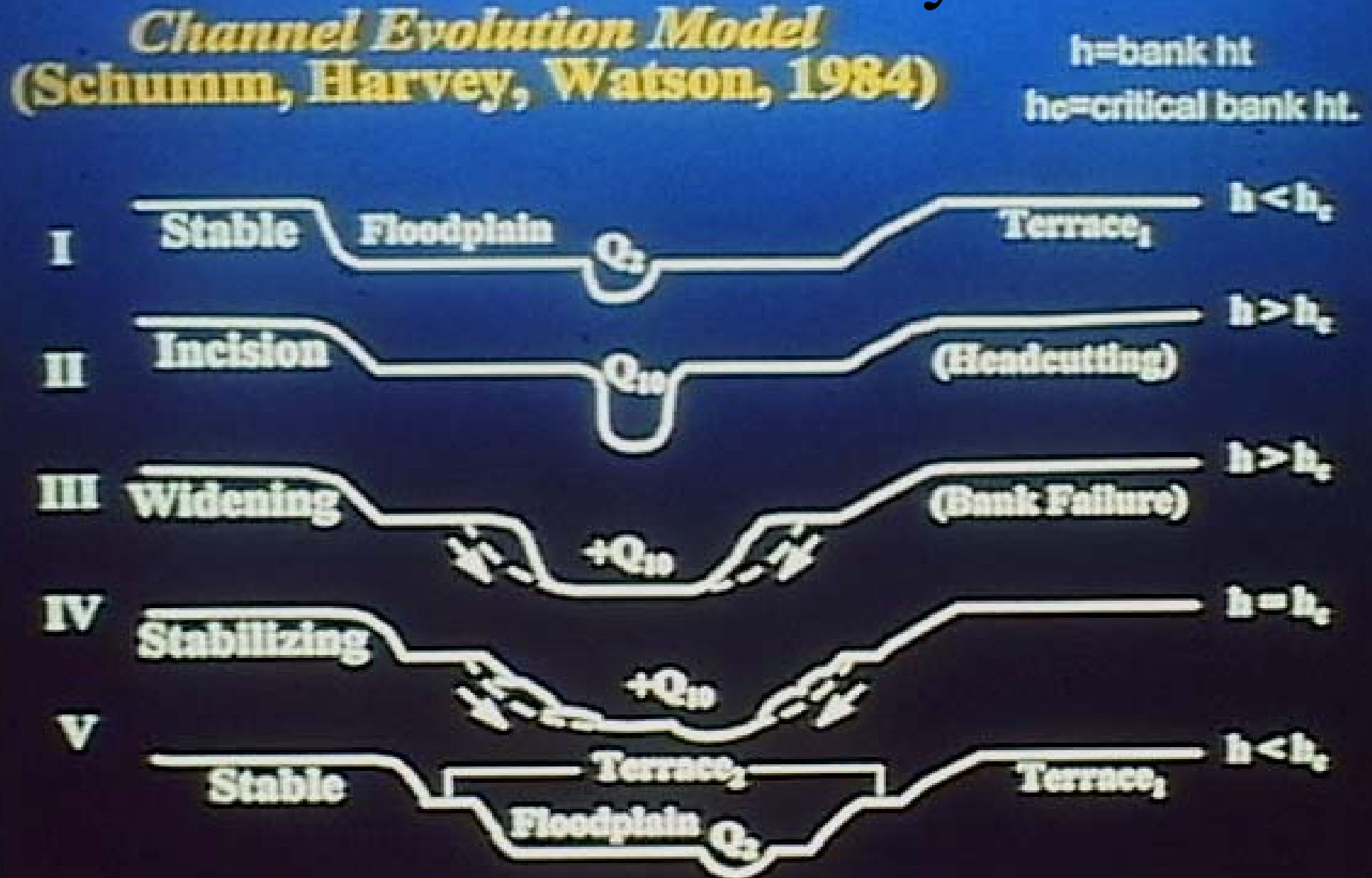
Effects on stream restoration design

Streams now exist where no stream existed naturally. Drs. Newbury and Chester Watson examine a peat bog drainage ditch with Project Engineer.



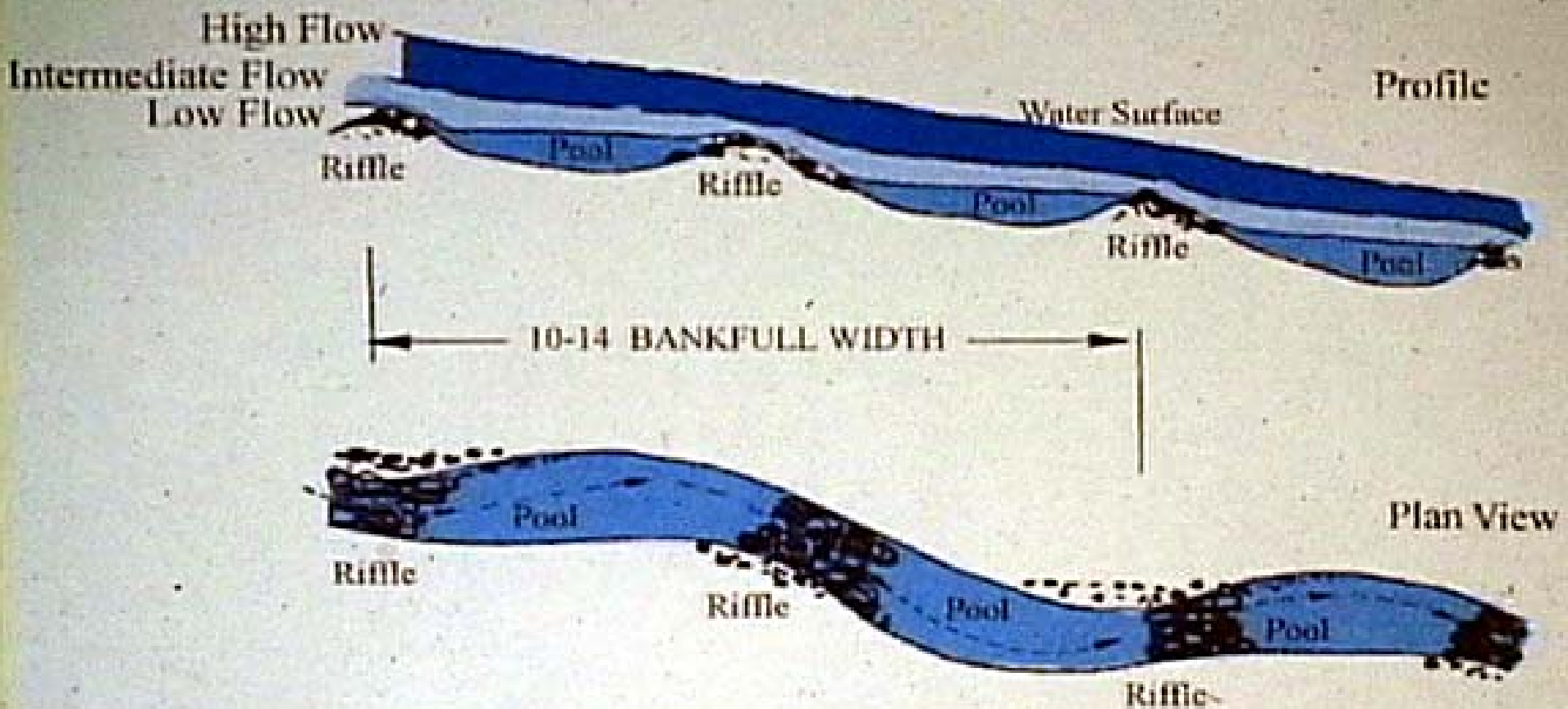
**Four
Seasons
Retirement
Center –
4 square
miles –
3 miles of
stream**

Streambed erodes down and then erodes laterally



Newbury Riffles (weirs, rock grade controls) in straight channelized streams





Meandering a drainage ditch into a stream in Sun City's Four Seasons Retirement Center - 4 square mile high rent development.



Bank restoration was Coir Logs with upper bank coir blankets. Vegetation included wetland plants and native grasses. Low rock riffles were spaced infrequently in this very low gradient stream.







Weirs breakup meander vectors

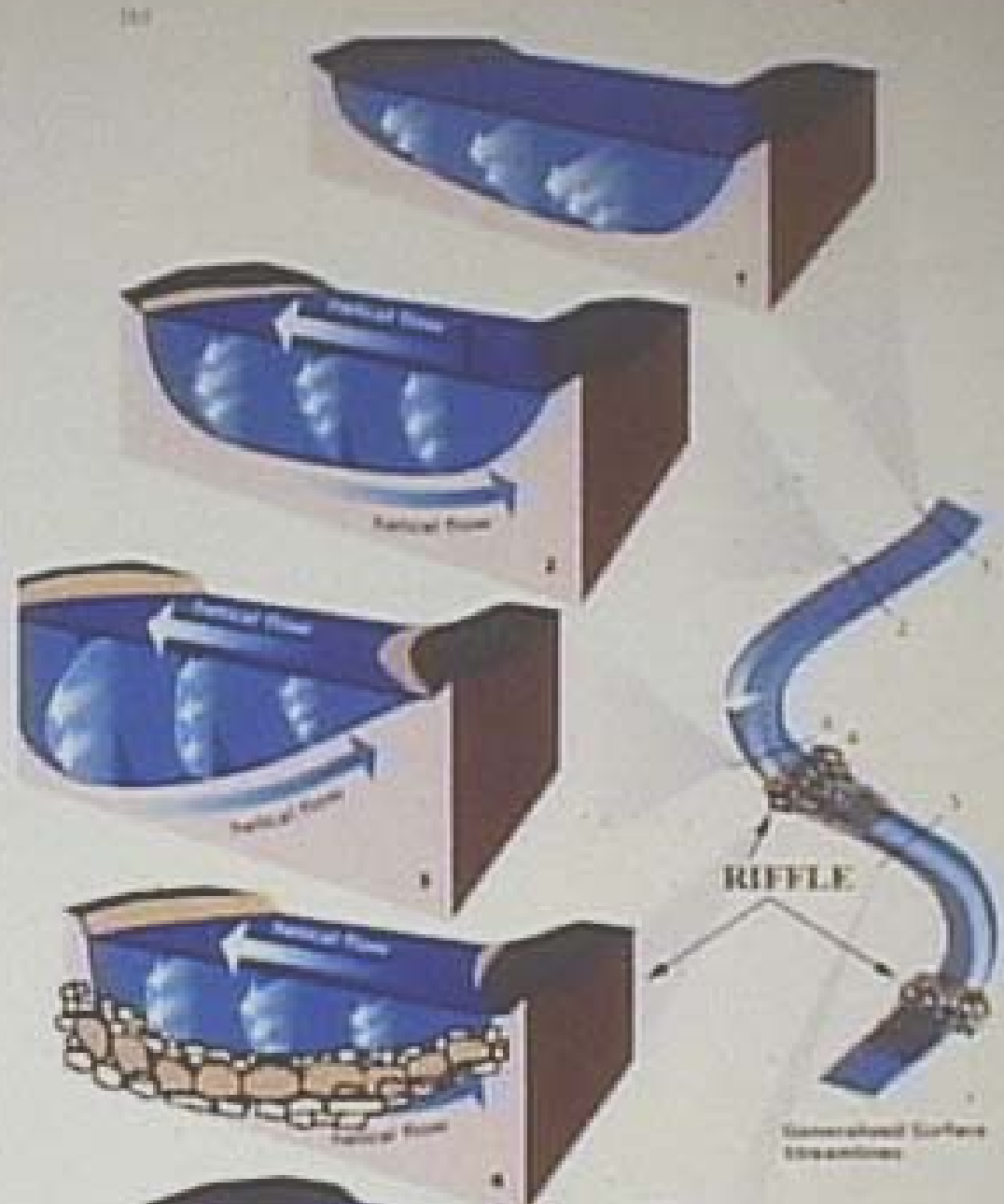
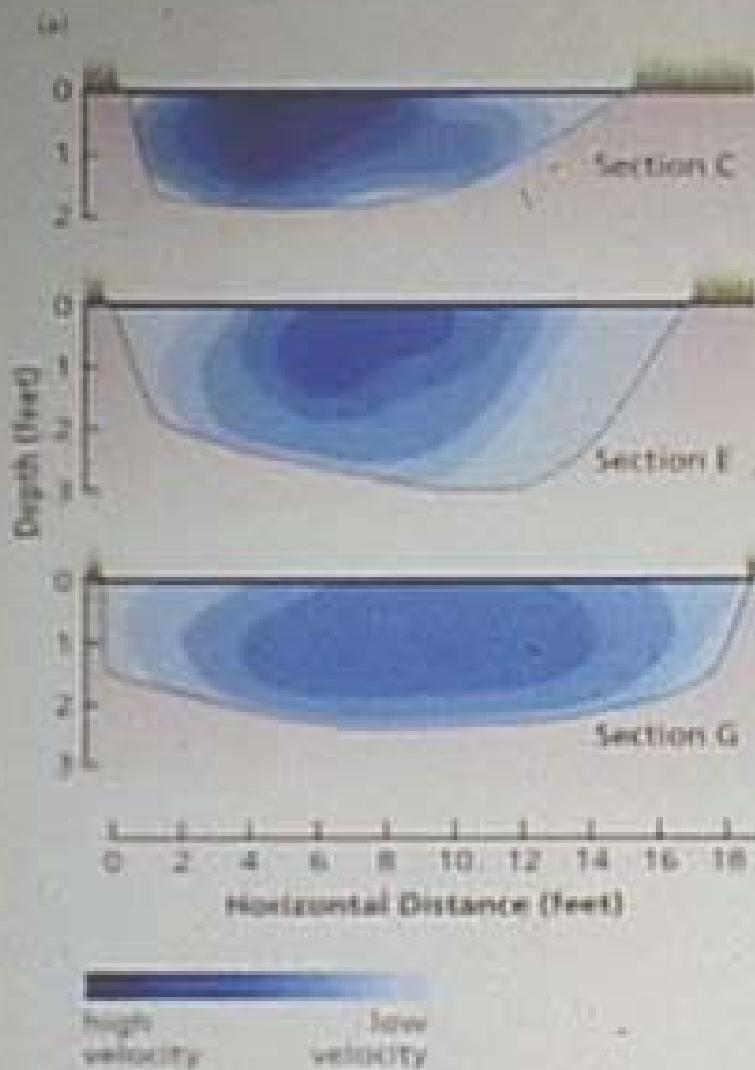


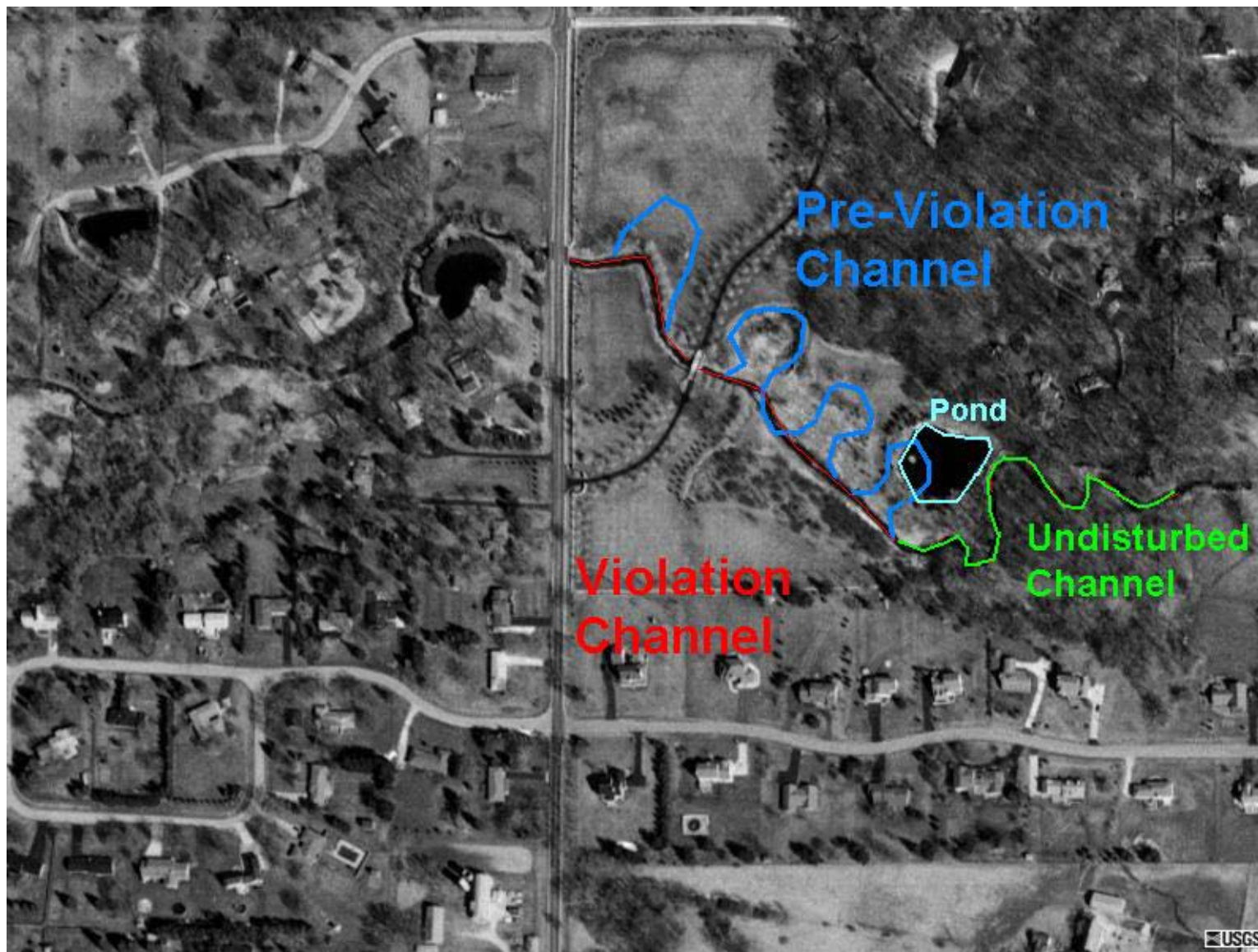
Figure 2.17: Velocity distribution in a (a) straight stream branch and a (b) stream meander. Stream flow velocities are different through pools and riffles, in straight and

Weirs placed in meander exits



Stoney Creek Project Summary

- Private landowners on a 40 acre estate, with Stony Creek flowing across the parcel.
- Landowners had employed an engineer to prepare a topographic map, and engineering plans to construct an off-line pond.
- Landowners applied for and received appropriate regulatory permits.
- Upon starting construction, the landowner decided to remove the eroding meanders from Stony Creek, and created a straight line, unstabilized channel. The new pond was partially constructed on an old meander.
- Regulatory hell followed.....



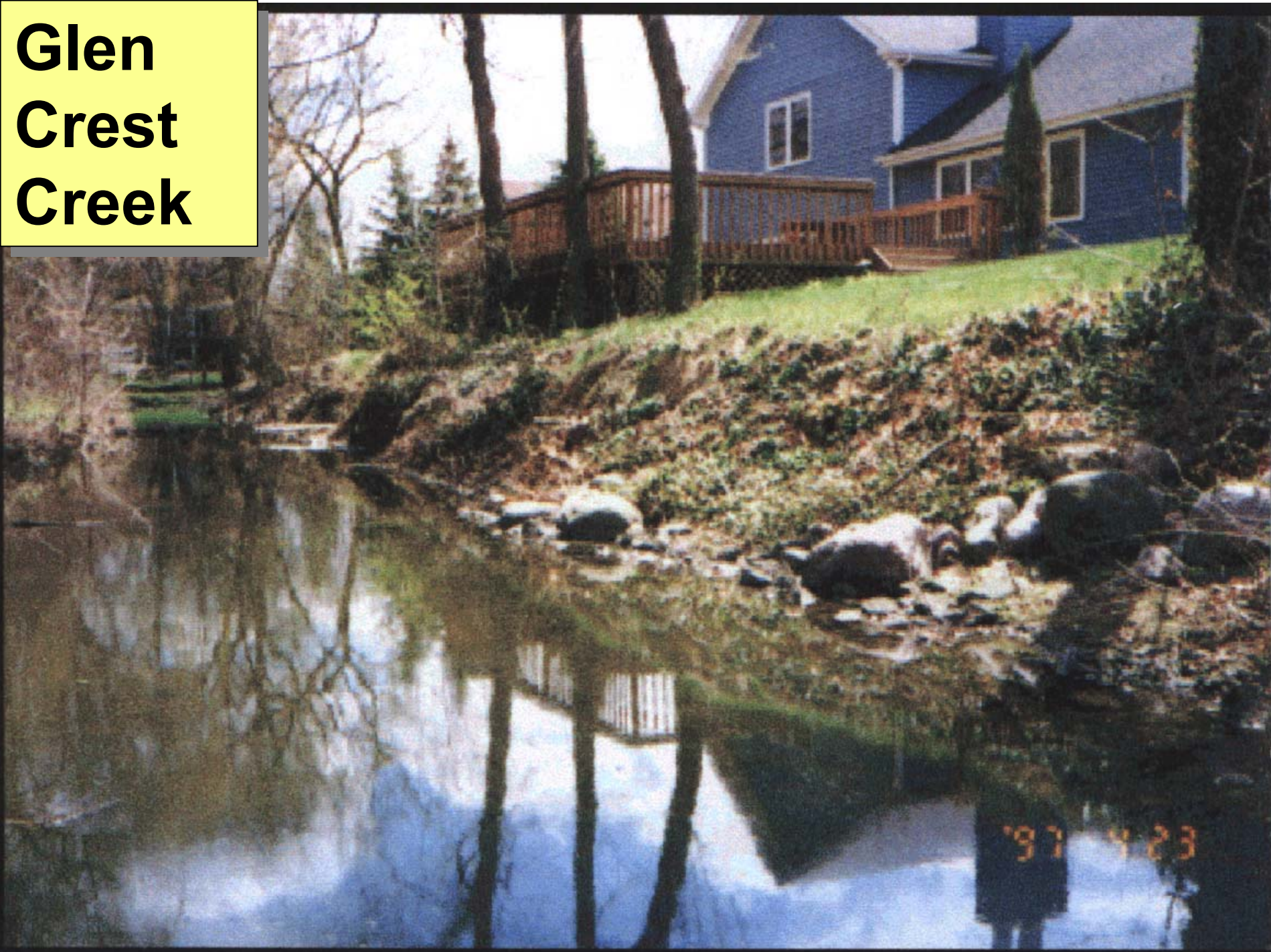








Glen Crest Creek











Soft Bioengineering in Urban Streams.

Is Everything Good?

**Tim Straub and Don Roseboom
Illinois District, USGS**































Brewster Creek Dam Notchings

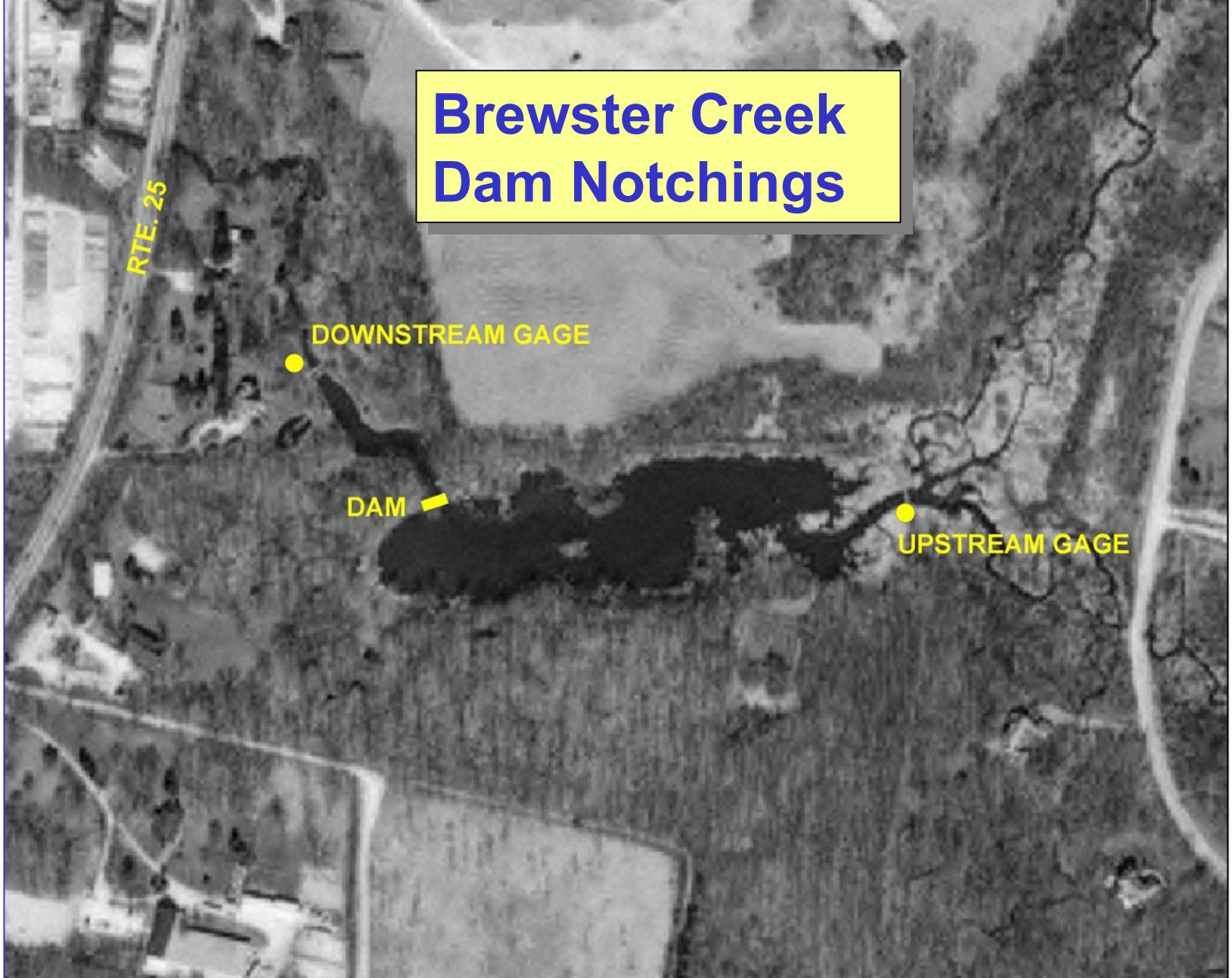
RTE. 25

DOWNSTREAM GAGE

DAM

UPSTREAM GAGE

0 250 500 1,000 Feet

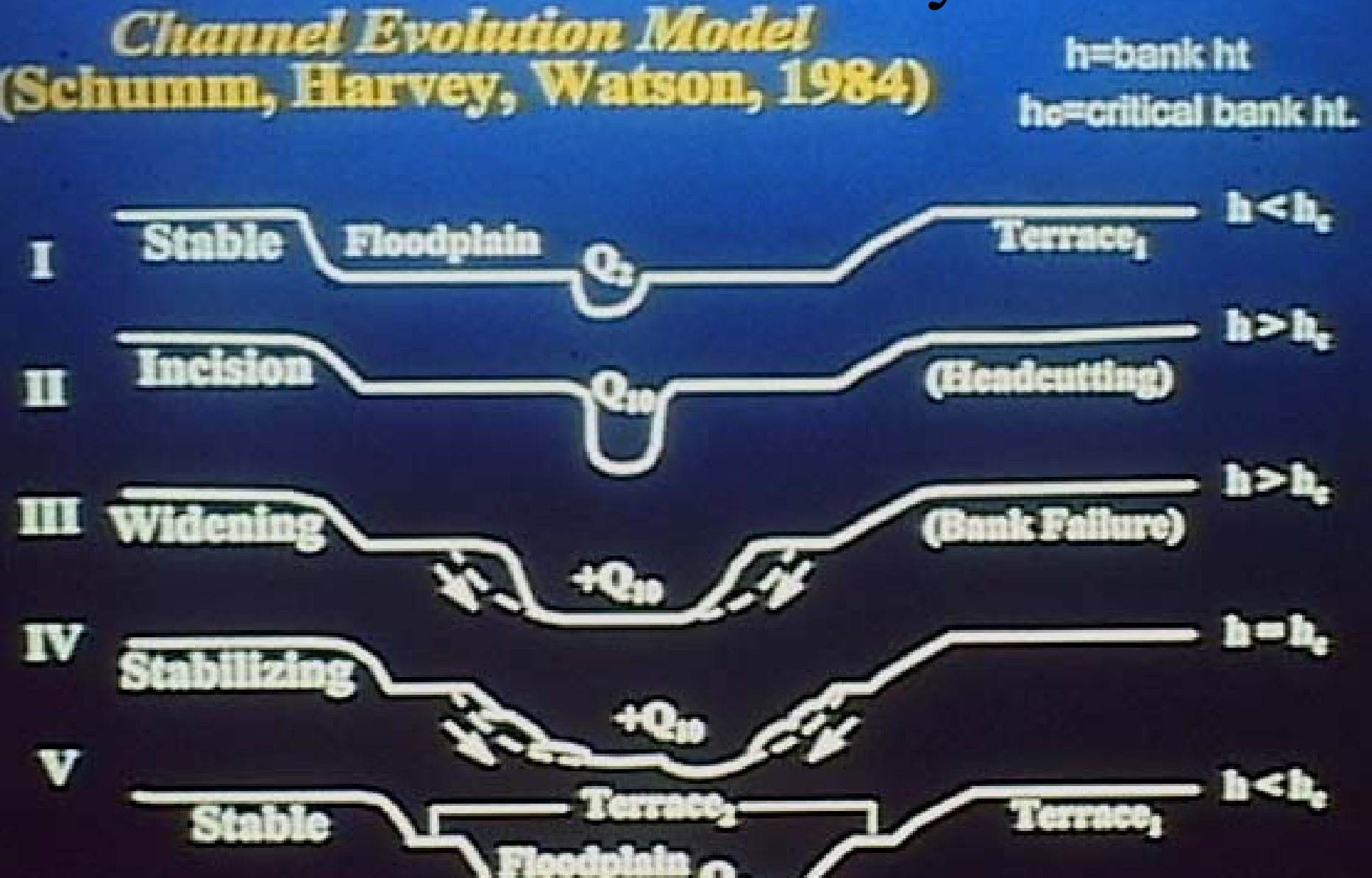








Streambed erodes down and then
erodes laterally







RTE. 25

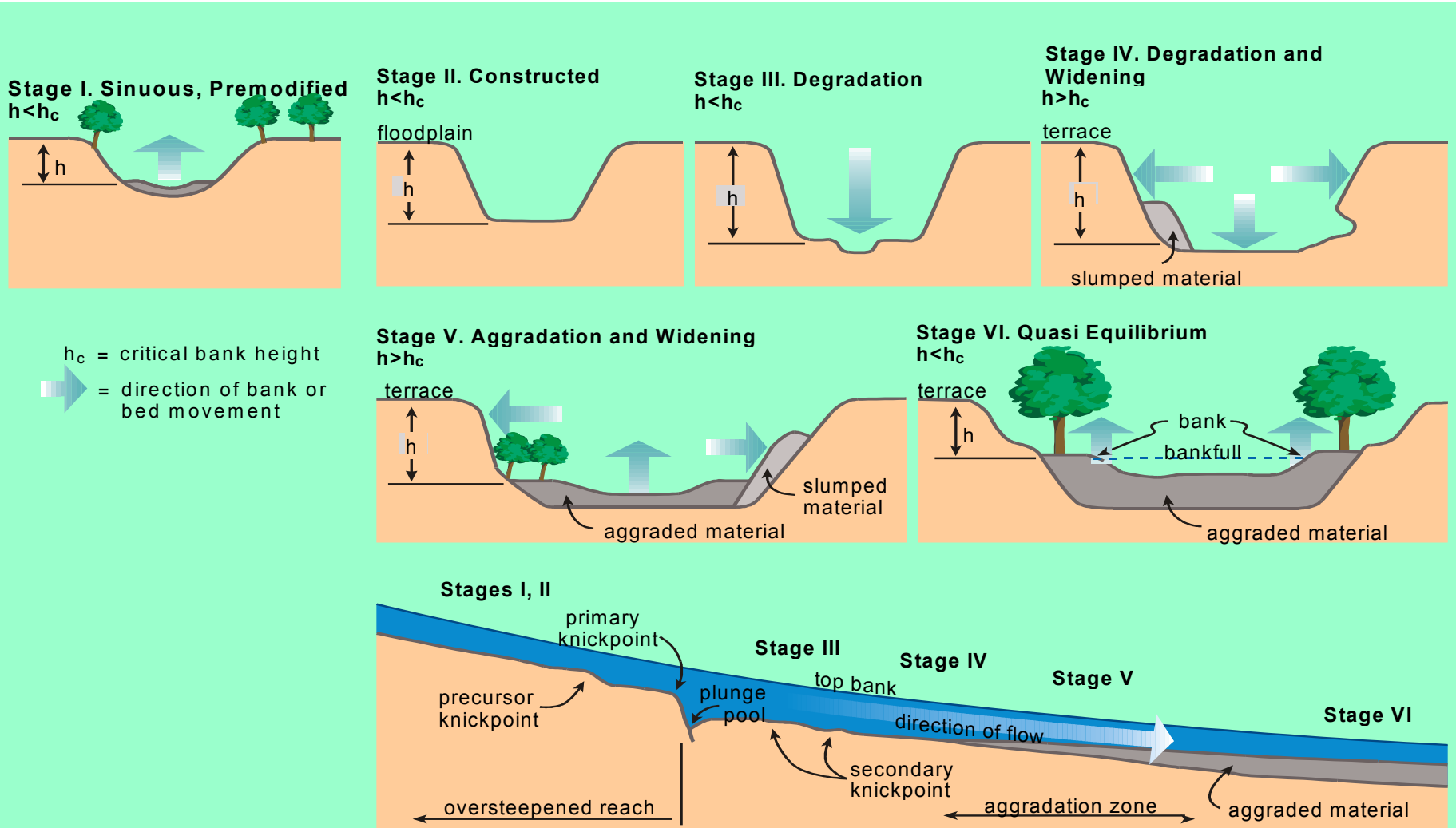
DOWNSTREAM GAGE

DAM

UPSTREAM GAGE



Stages of Channel Evolution

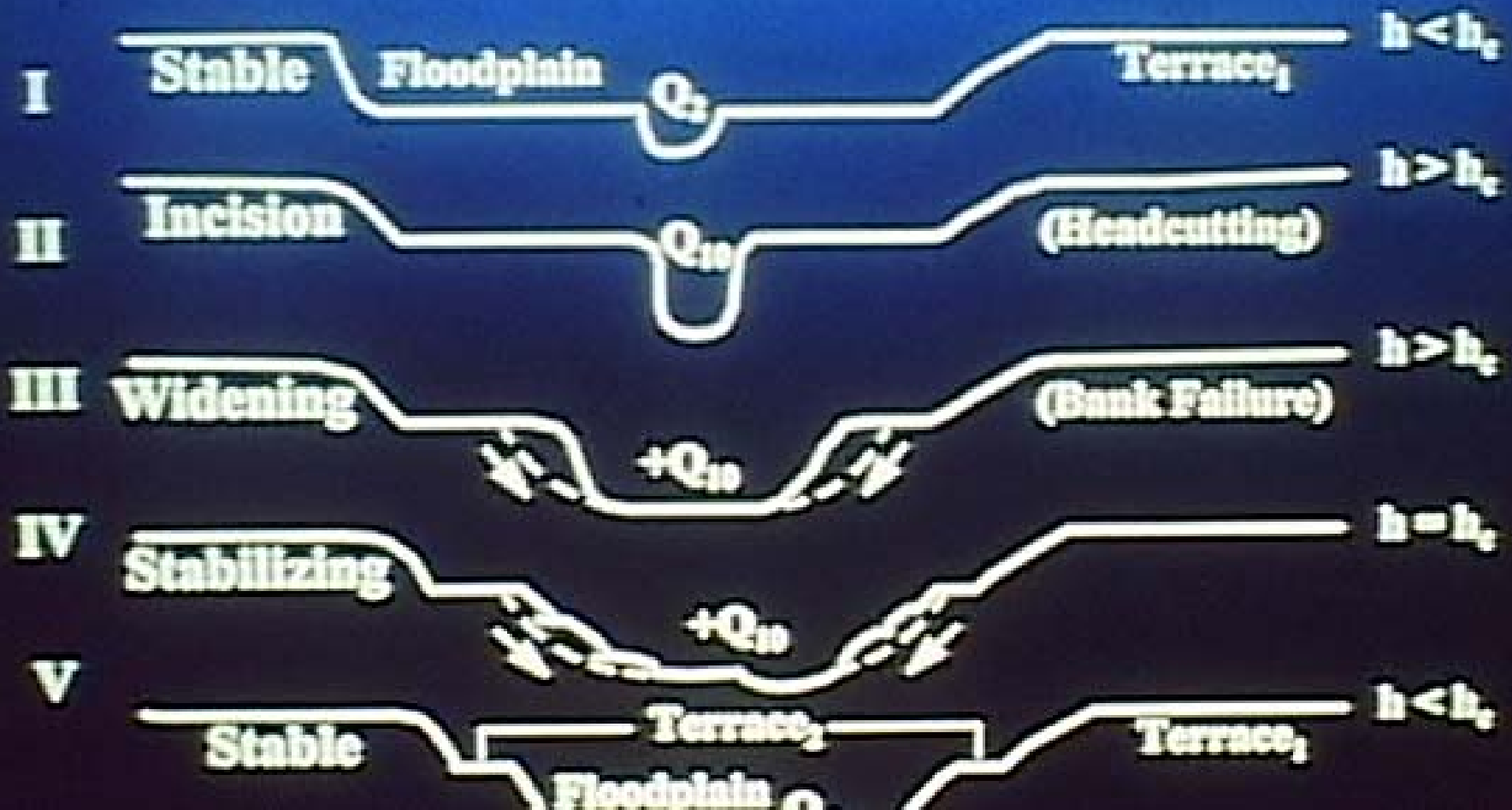




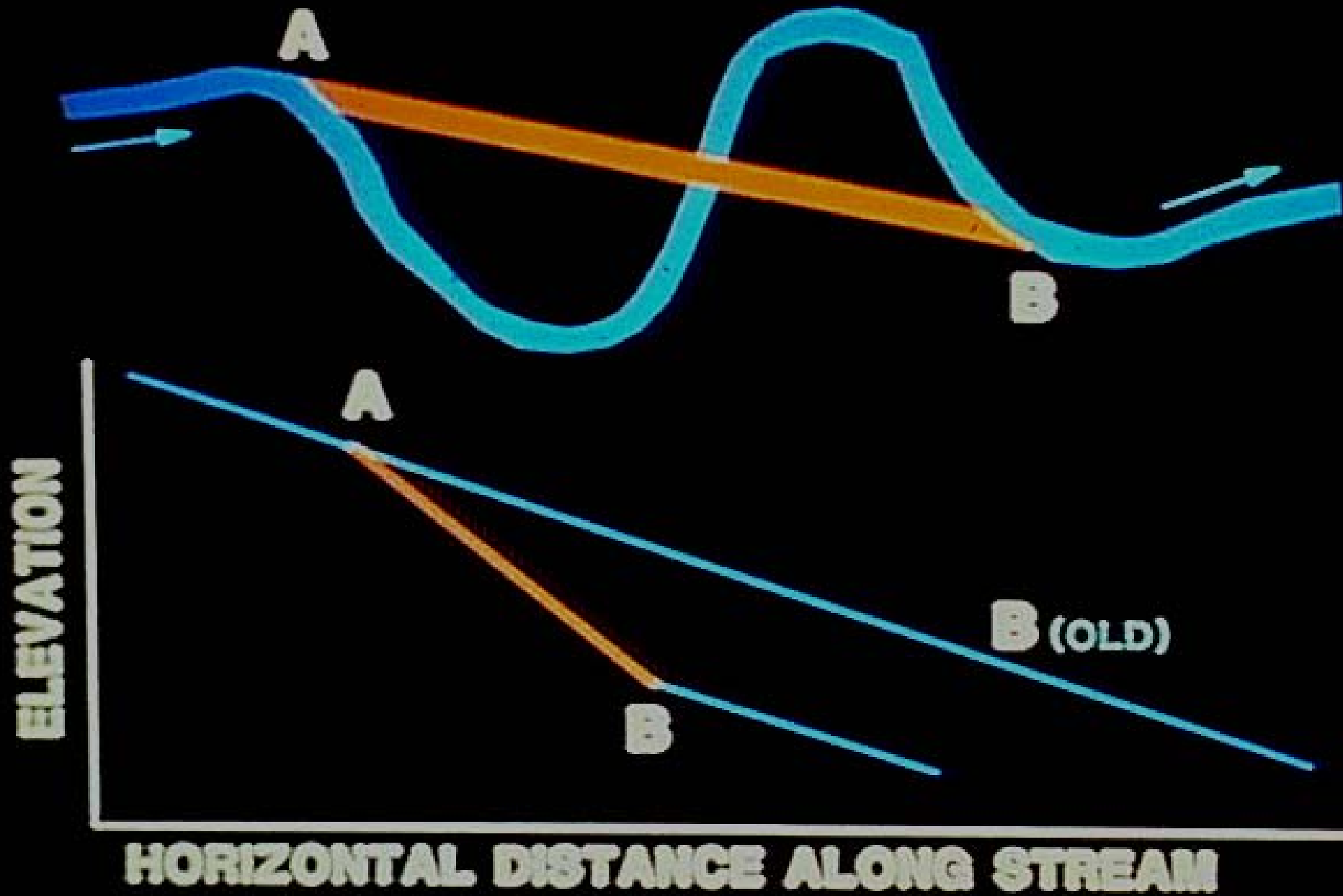
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Channel Evolution Model
(Schumm, Harvey, Watson, 1984)

h =bank ht
 h_c =critical bank ht.



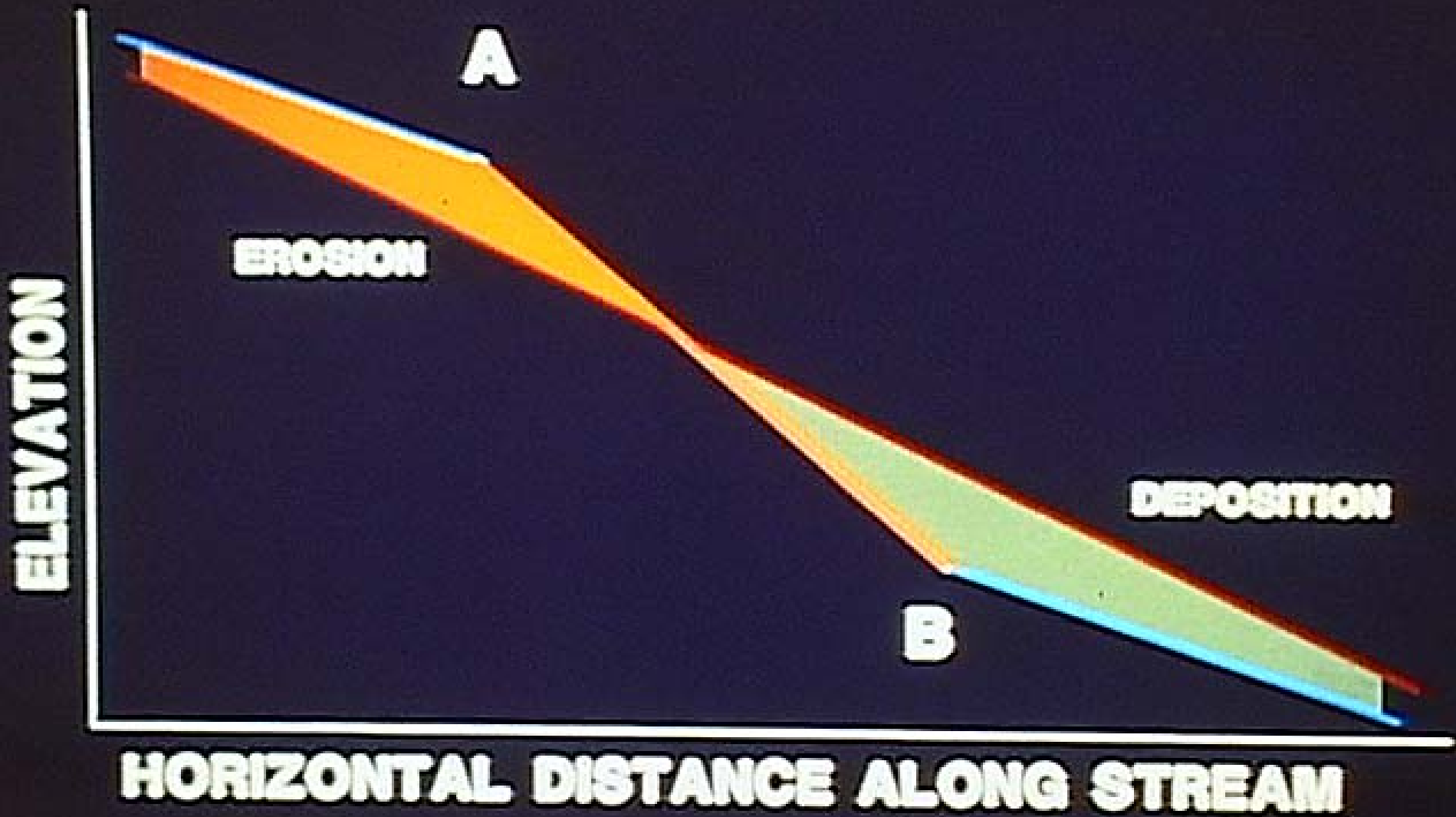
Channelization effect on slope

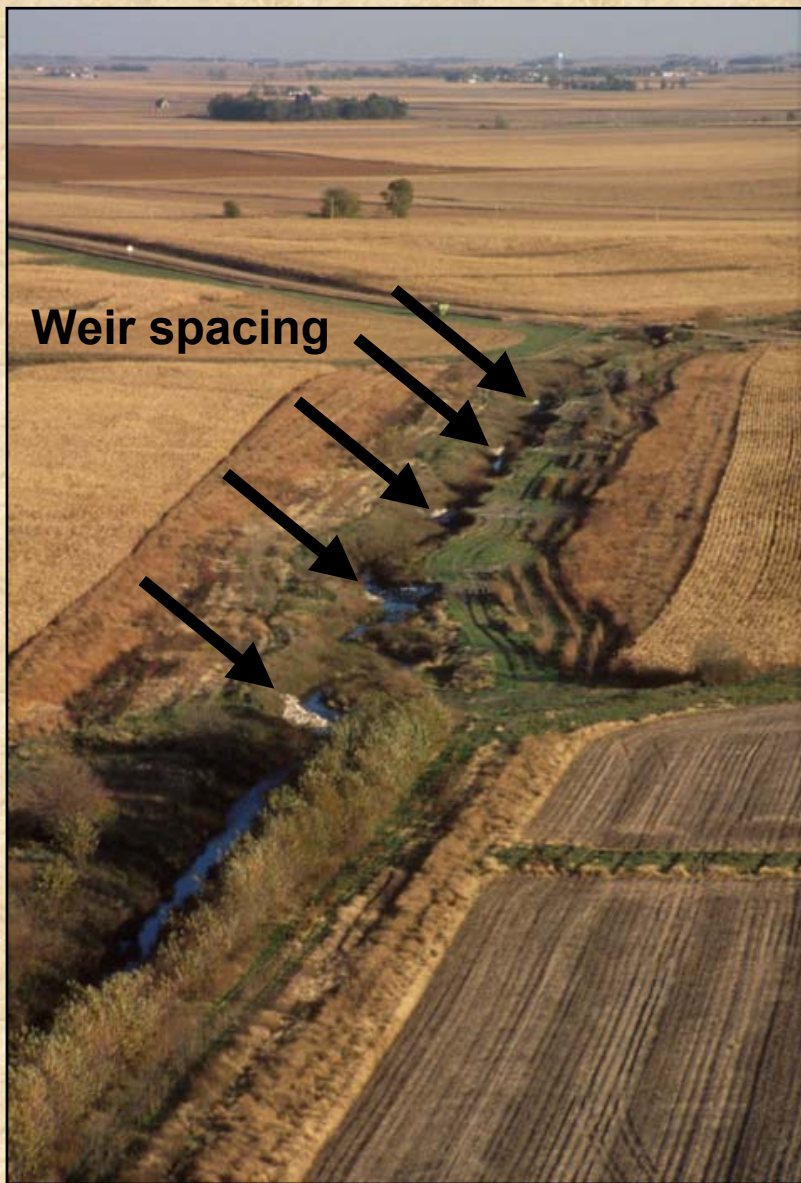


Headcut – Incision - Knickpoint



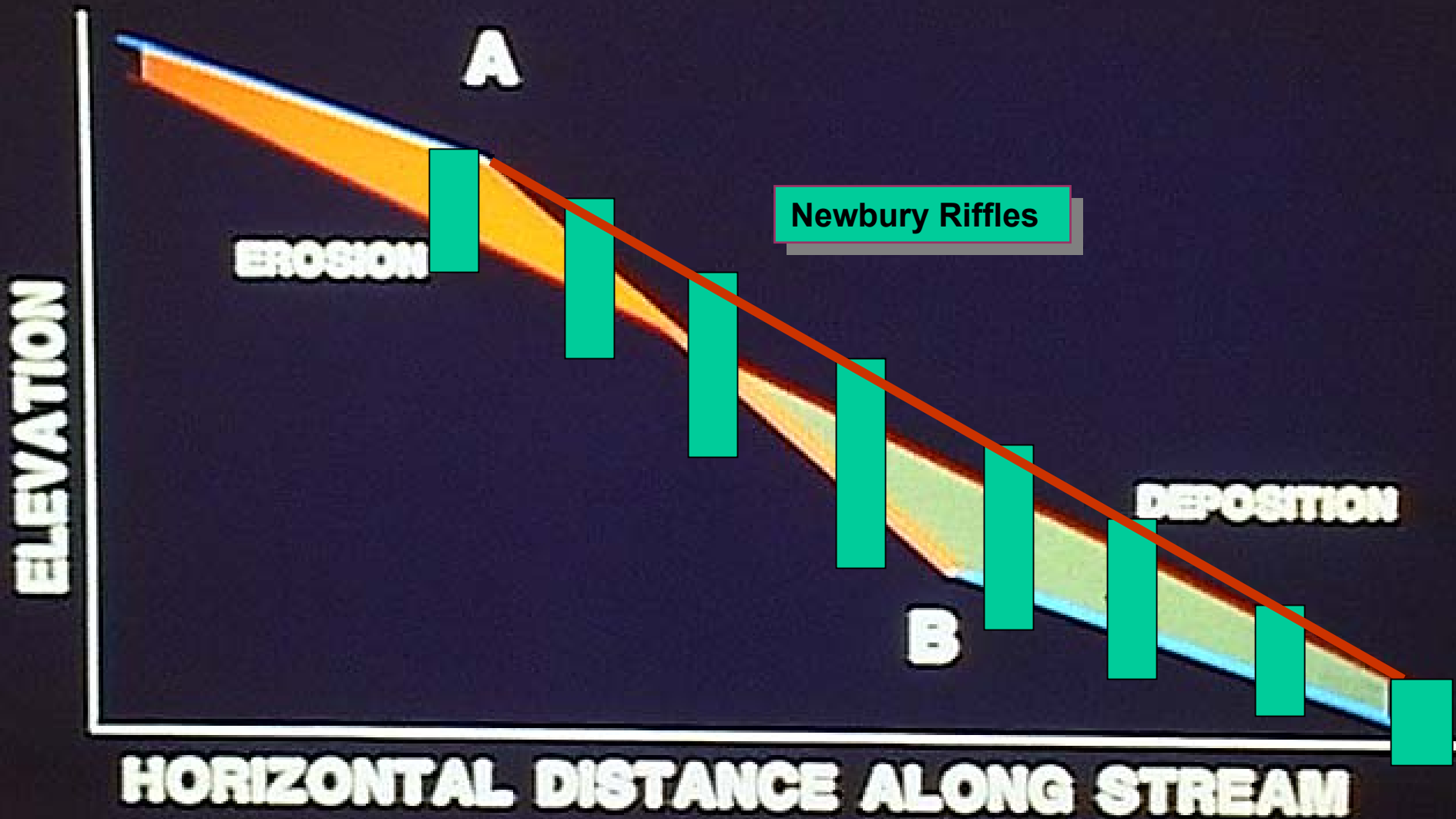
Slope effect on erosion





Weirs spaced about 300 ft apart. Total length of one weir about 75 ft.

Newbury Riffle effect on slope









Waukegan River

National EPA Watershed
Monitoring Project 1991-2003

**50+ projects were reviewed.
Most referenced the
Waukegan River BMPs**

Downtown Washington Park, channel eroded across manhole



Limited pool depth during summer low flow prevented healthy fish populations



The 2nd National EPA NPS Conference highlighted urban stream bank BMPs



While bank stabilization protected property, pool and riffles were required for fish.



Most pollution intolerant species
were found in swift rock riffles



Large salmon are not included in IBI calculation but highly valued



Urban Nonpoint Pollution killed small salmon instantly in 2000. Urban storm water quality is limiting factor.







Figure 10 Stream bank restoration (after)



Fig. 3. Bridge pier at the 14th Mile Dam (left).





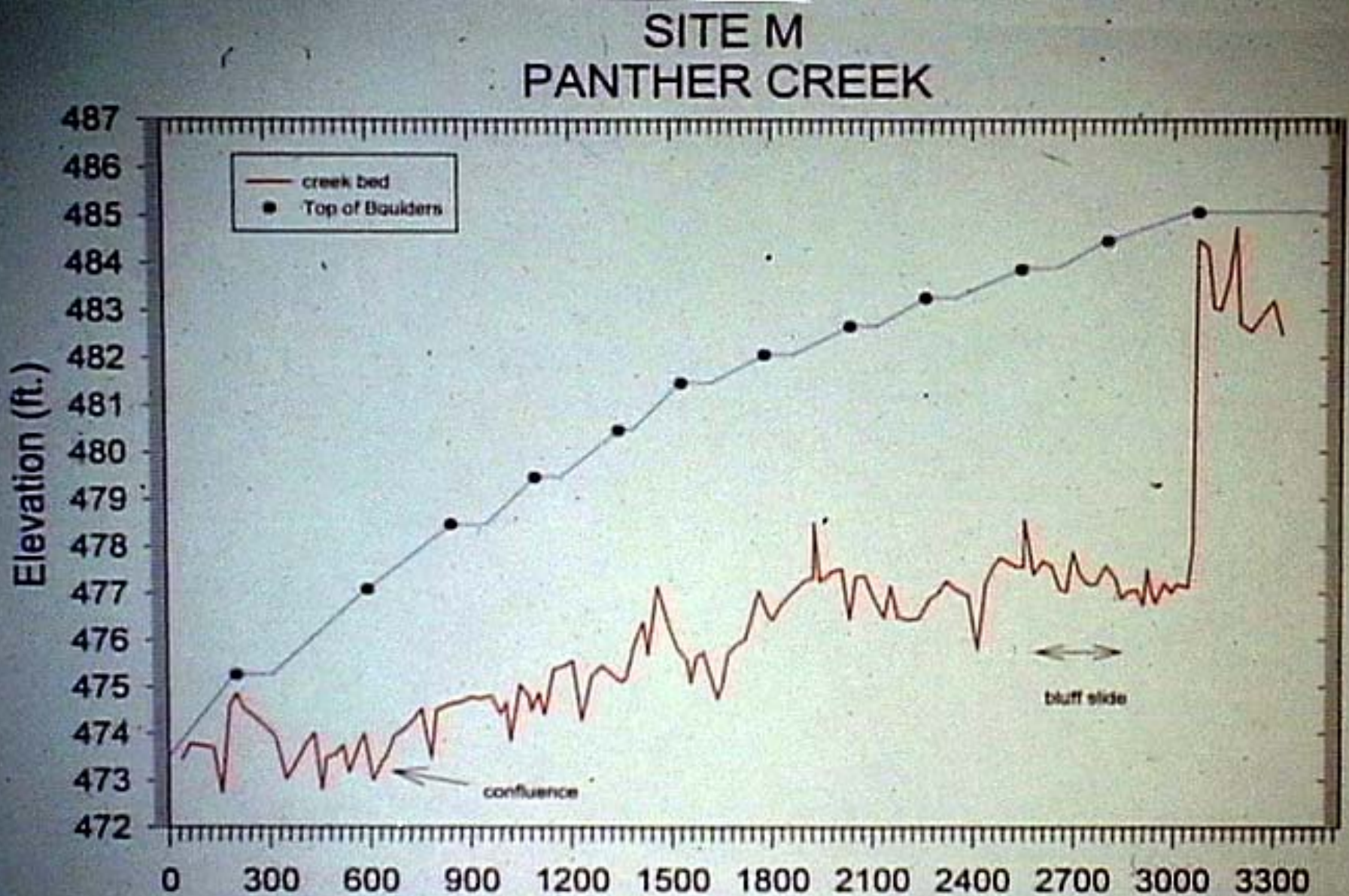




Incision undercut trees logjams increased widening



Headcut just upstream of bluff



Incision undercut bluff





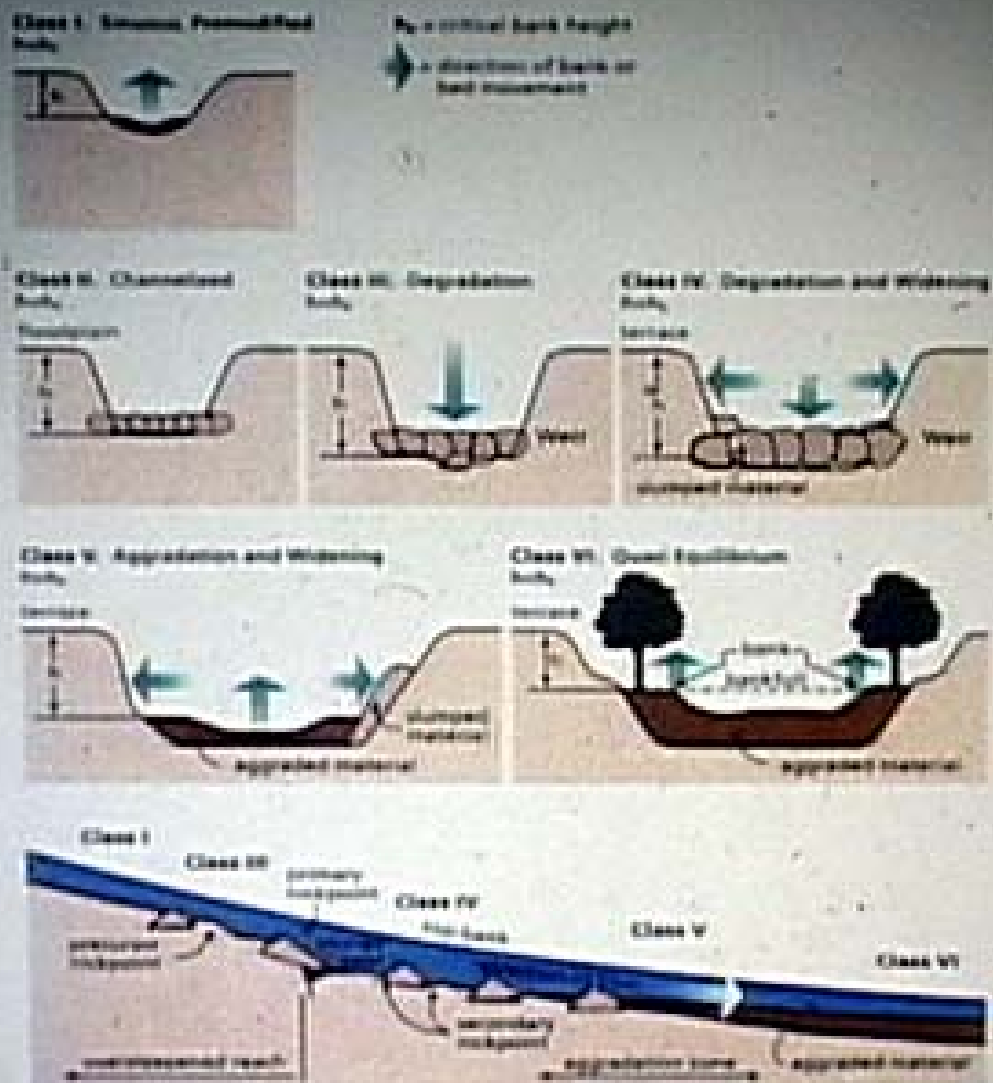
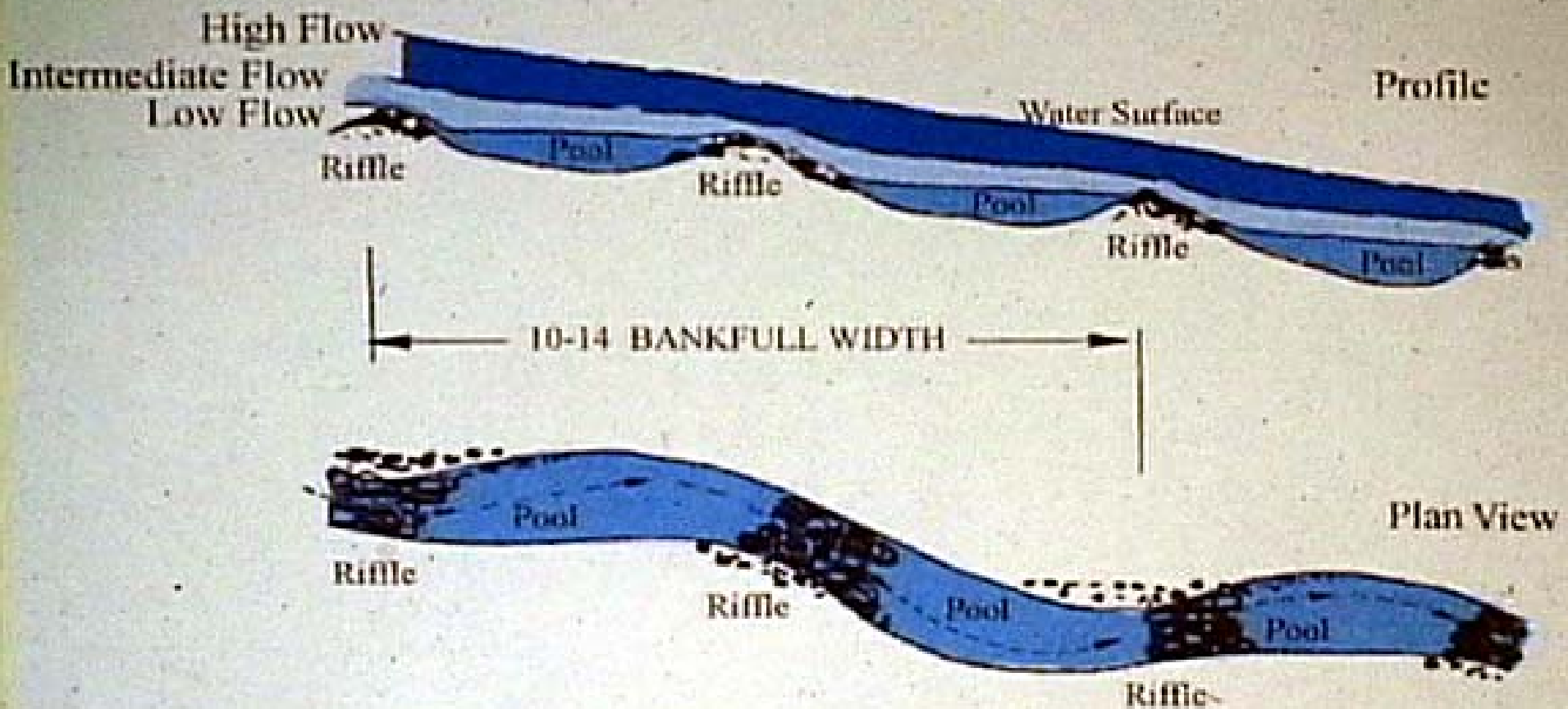


Figure 2.14: Channel evolution model. A selected or instream reach is in varying stages of degradation or aggradation along its length or profile. A channel evolution model theoretically may help predict future upstream or downstream changes in habitat and stream morphology. (Source: Simon and Collin, 1999)

Newbury weirs in channelized streams







Velocity vectors in meander

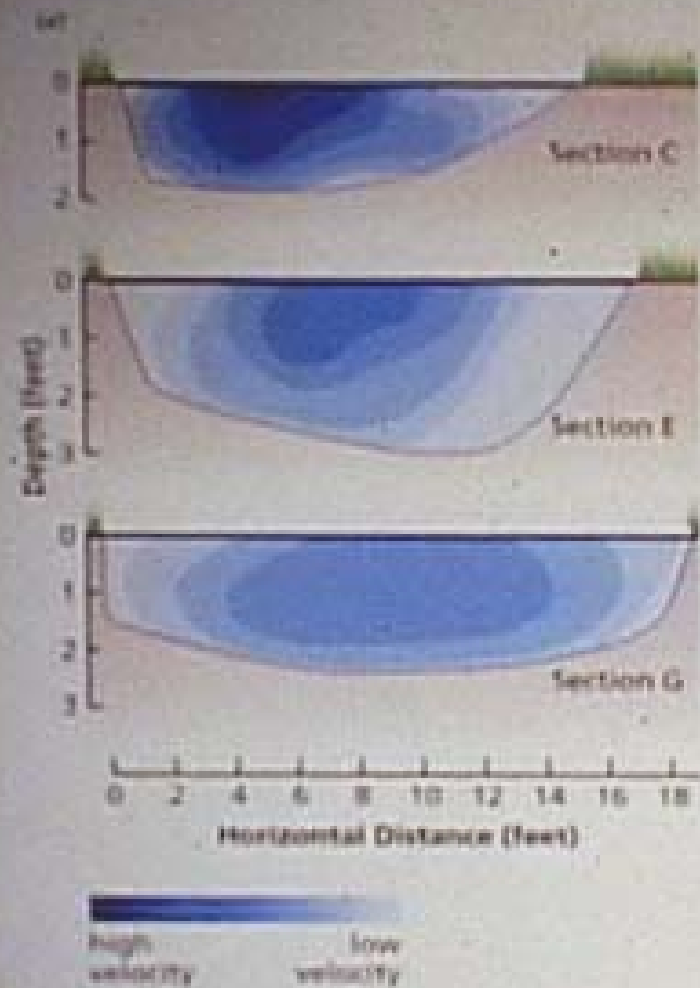
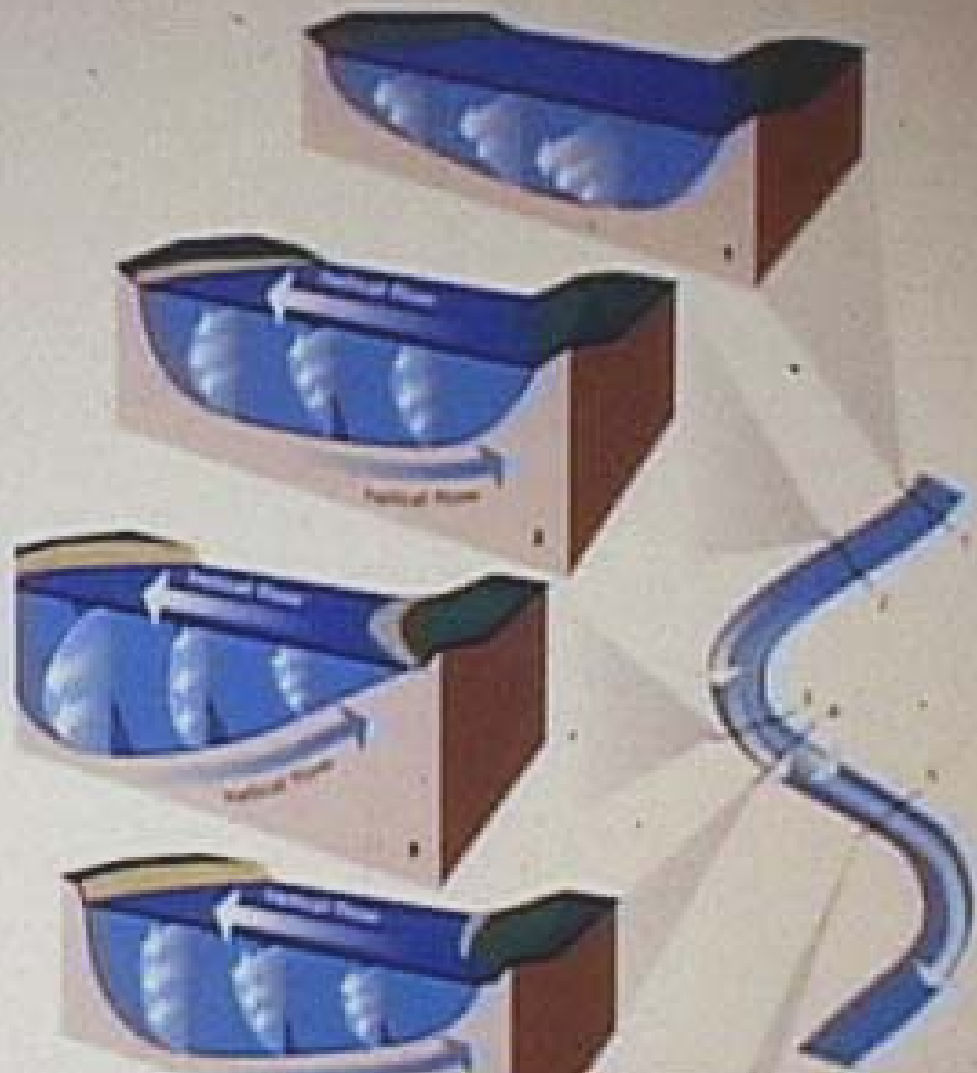


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Weirs placed in meander exits



Weirs breakup meander vectors

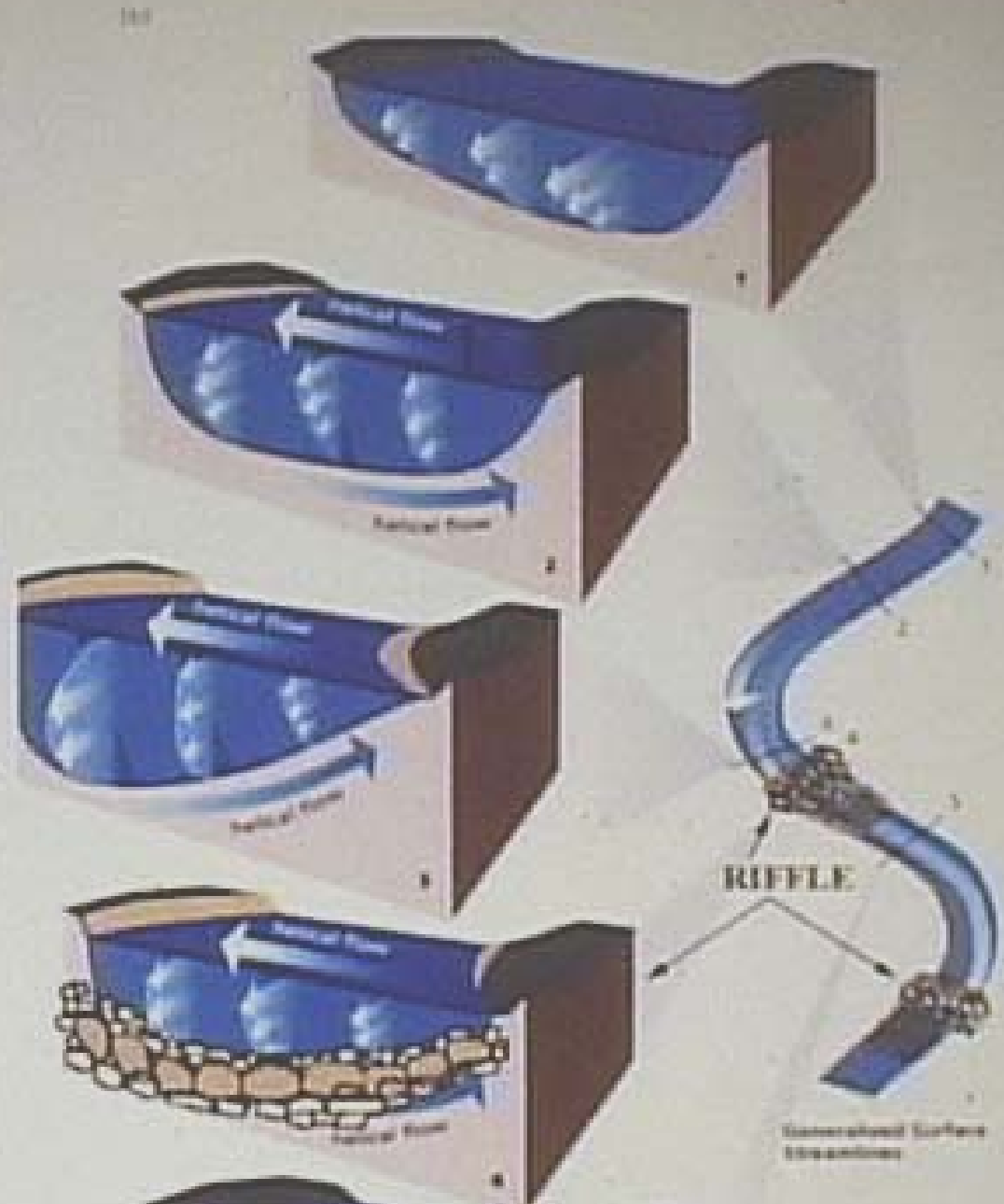
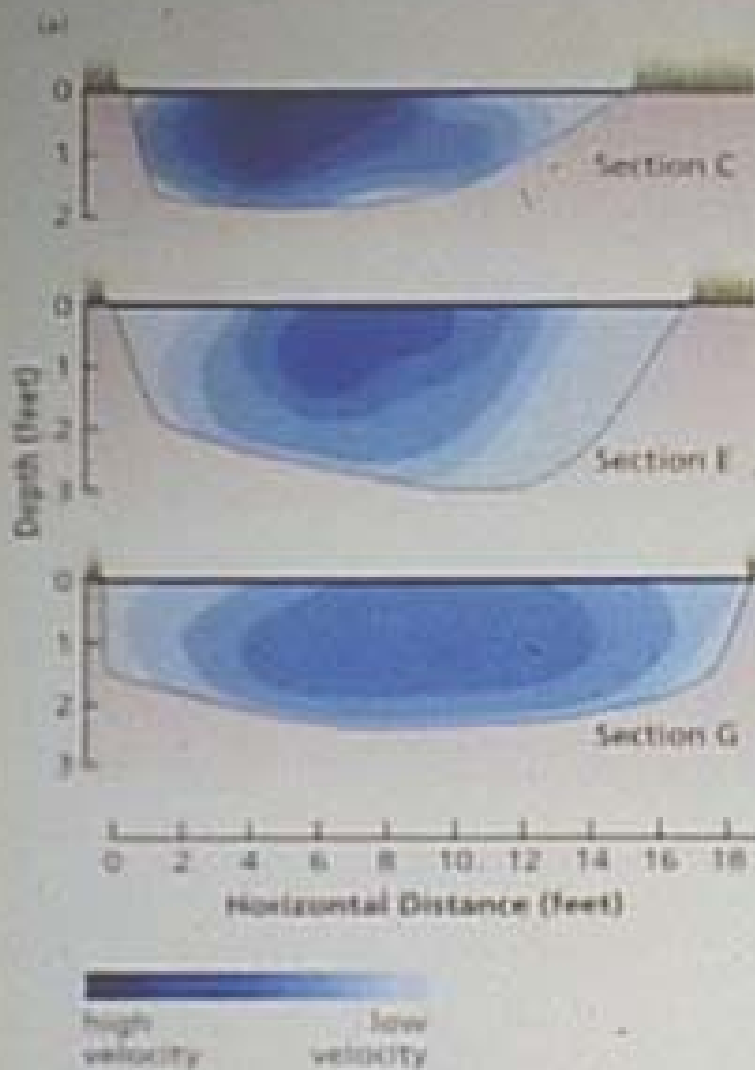


Figure 2.17: Velocity distribution in a (a) straight stream branch and a (b) stream meander. Stream flow velocities are different through pools and riffles, in straight and

Installing weir at meander exit



Looking downstream of weir crossing



Looking upstream at weir crossing



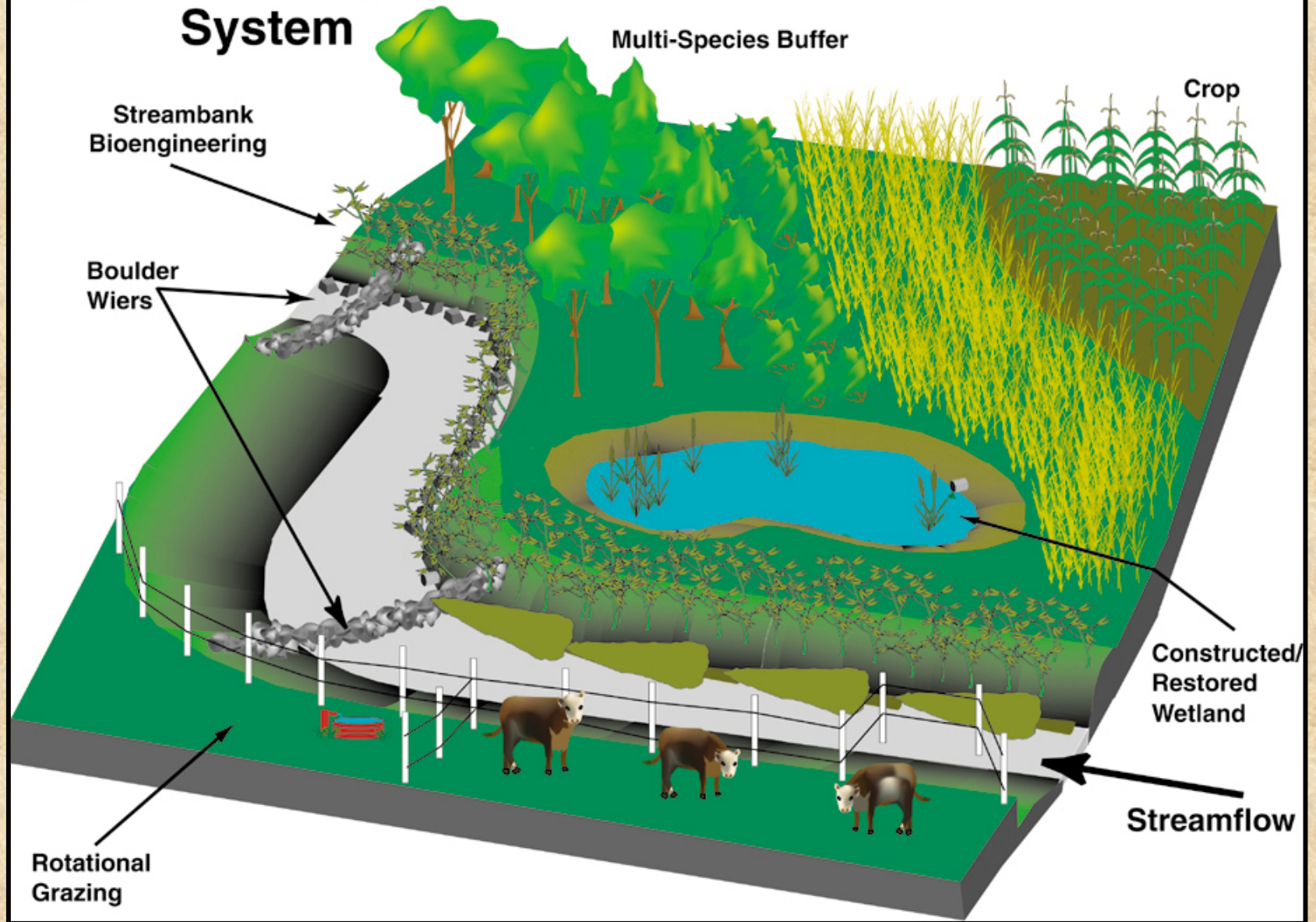
Truck crossing weir



Pool depth and vegetation below road crossing after 5 years

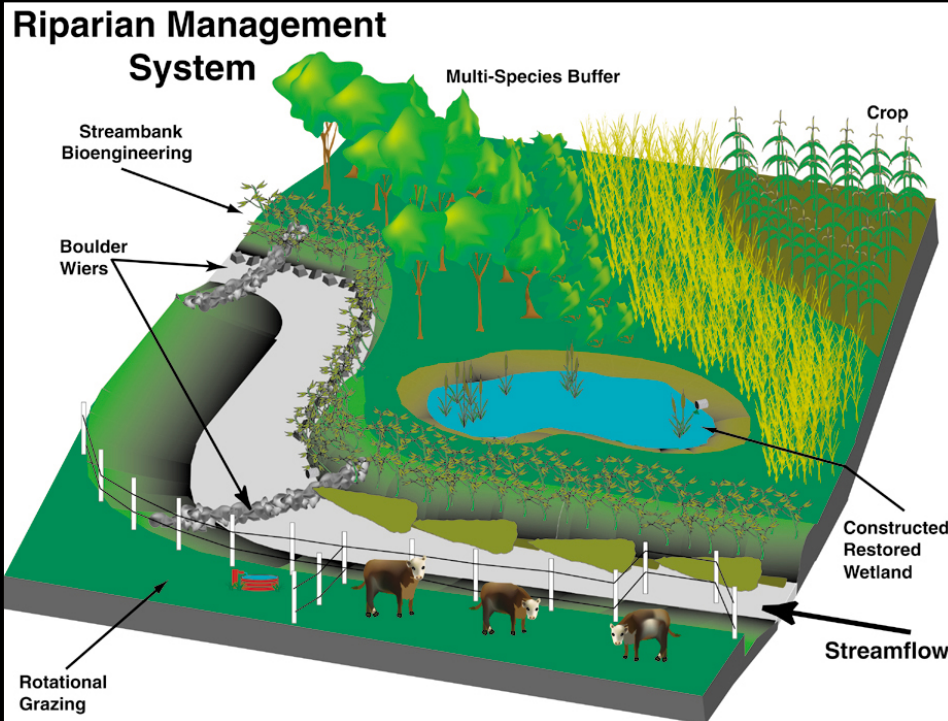


Riparian Management System



Workshop Outline

1. *Rapid Watershed Assessment of Streams and Wetlands*
2. *Stream Channel Incision and Wetland Drainage*
3. *Rehab Illinois Streams*
4. *Bioengineering BMP performance.*







The aerial survey equipment also documents watershed features at ground level with hand-held cameras in digital video and still formats



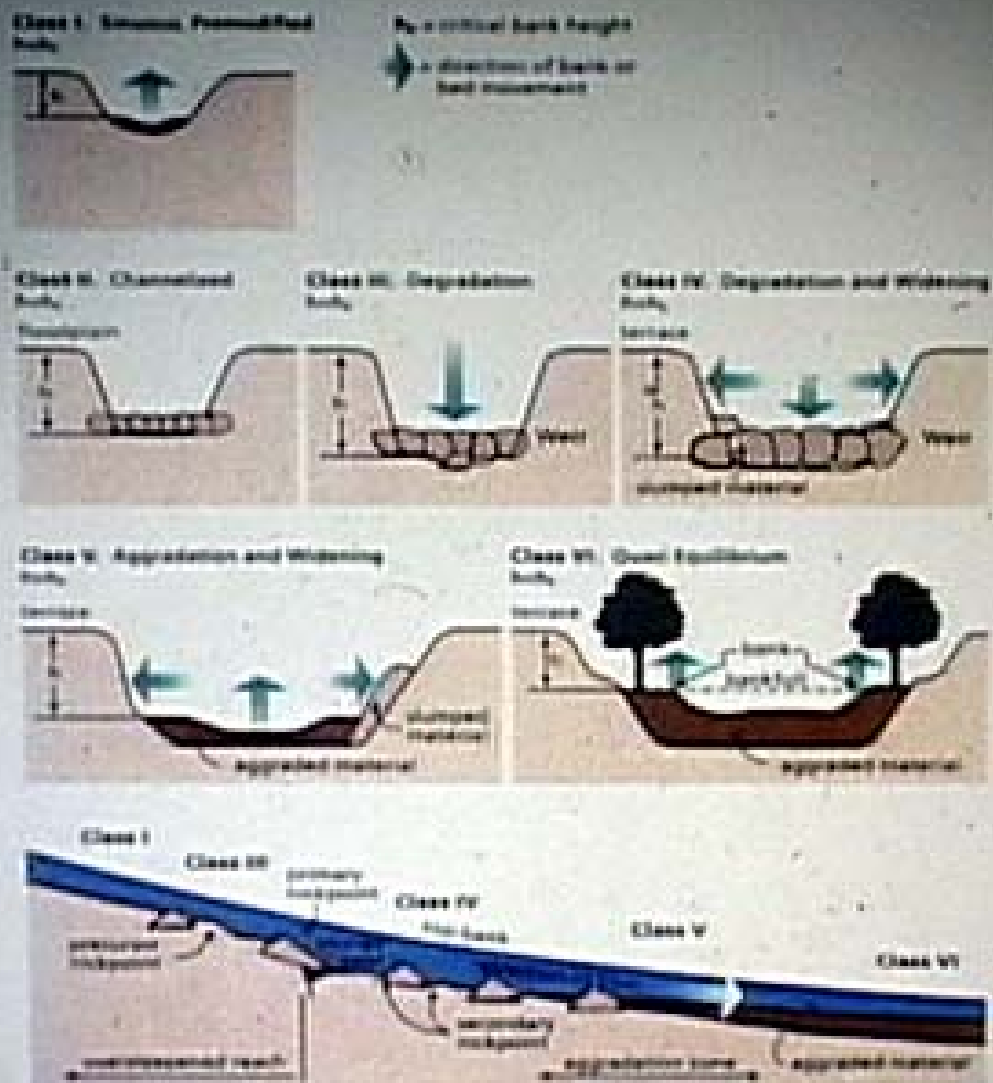


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Small game fish and intolerant species
increased in rock riffles, deeper pools



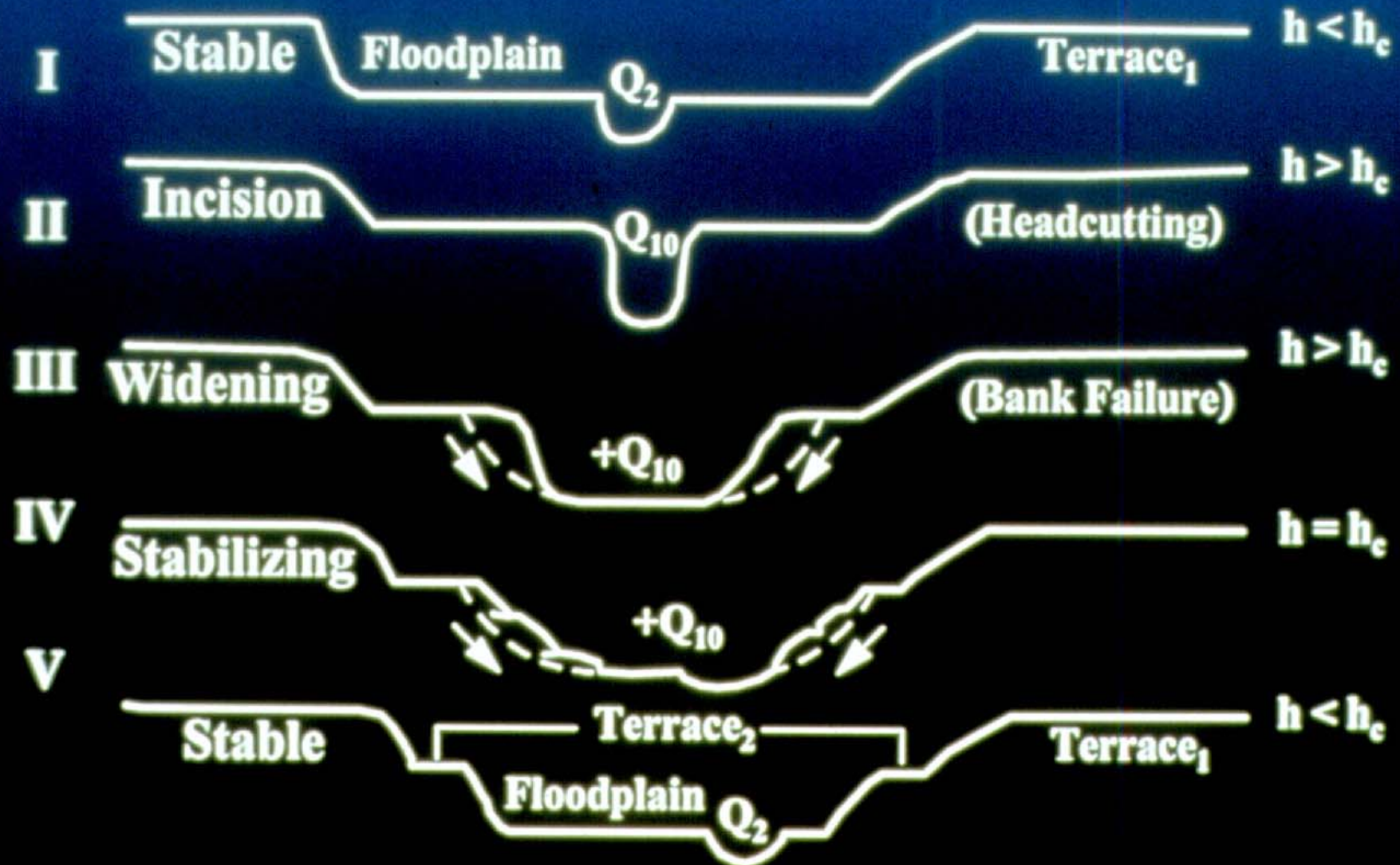


Other Lessons Learned:

- In a regulatory violation setting, a **major challenge** is trying to **coordinate** between the **various regulatory interests**.
- **“Softer” bioengineering practices** can **work in high stress situations**; are typically **more compatible with regulatory permit staff**; and **help** address the **“no-feasible-alternative” requirements of the Section 404 program**.

Channel Evolution Model (Schumm, Harvey, Watson, 1984)

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What Happens to Water Movement When - When Urban Areas Expand?



Results:

- Large % of impervious surfaces
- Compacted lawns & parks
- Rapid runoff
- High chemical load in runoff
- Streams deepen & widen
- Aquatic ecosystem destroyed
- Potential for significant flooding



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